

Proposed Core Hypothesis/Question Justification

Social Environment Working Group

I. Social environmental influences on asthma

Disparities in the prevalence, severity, and effective management of asthma by race and socioeconomic status are explained, in part, by social environmental factors and processes that influence exposure to physical environmental risk factors, psychosocial stress, and health-related behaviors.

II. Workgroup: *Social Environment*

III. Contact persons for proposed core hypothesis/question

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IV. Public health significance

Asthma prevalence is increasing in the United States. Between 1980 and 1994, the prevalence of asthma increased 75% overall and 74% among children 5 to 14 years of age. The Centers for Disease Control and Prevention estimate that asthma accounts for 10 million lost days of school annually; and costs \$3.2 billion per year in treatment for children under 18. It is the third-ranking cause of hospitalization among those younger than 15 years of age.¹

Asthma death rates are highest in areas with higher concentrations of poor people and minority residents (particularly African Americans).^{2,3} In national surveys, African Americans report higher rates of asthma and a higher increase over time. Prevalence rates vary among Hispanic populations, with Mexican American children in the Southwest experiencing a low prevalence and Puerto Rican Children in the East high prevalence.⁴

NHIS data reveal a higher prevalence of asthma in urban areas, but evidence suggests that rates can be as high in some rural areas.⁴ Asthma mortality and hospitalization vary significantly among large cities and among neighborhoods within cities.⁵ Severe asthma demonstrates a graded association with SES in the U.S., but evidence of an SES gradient in asthma prevalence generally is less clear, perhaps because of diagnostic biases. Racial differences in asthma prevalence and severity are independent of SES.⁵

V. Justification for a large prospective, longitudinal study

A. Multiple aspects of the social environment influence asthma etiology and management. Although asthma itself is common, elucidating the complex pathways that contribute to asthma will require a large sample because interactions will be common. For example, we anticipate interactions between family economic

- disadvantage and social policy variables such as the generosity of welfare programs and the design and enforcement of public housing programs and codes.
- B. A large prospective study is needed to adequately represent a range of geographic, environmental, economic, cultural, and policy variability among neighborhoods and communities, to select enough cases within neighborhoods and communities to permit estimation of neighborhood effects, and to model social and physical environmental influences.
 - C. Residential mobility is a critical problem in studies of neighborhoods and neighborhood effects. A prospective longitudinal study will be able to follow respondents over time and monitor residential mobility in order to assess residential change or mobility and the role it plays in health disparities by socioeconomic status, race, and geography.
 - D. Collection of retrospective data on variables such as family stress, parenting, and cultural beliefs is not possible. These factors must be observed prospectively.

VI. Scientific Merit

The existence of social environmental determinants of asthma etiology, severity, and management is evident from the strong differentials in asthma and asthma mortality noted above. The social factors and mechanisms involved are only beginning to be studied. Wright and Cohen⁵ suggest that differentials are likely to occur via four pathways: environmental exposures; stress; health behaviors and psychological factors; and access to health care.

Minorities and economically disadvantaged populations are more likely to experience unhealthy environmental exposures, including antigens and pollutants that are linked to asthma. This occurs in part because social, economic, and political disadvantage increases the probability that such groups will reside in impoverished urban environments where the levels are high; and in part because the same disadvantages reduce their ability to escape such areas or improve their physical environment through collective action⁶. Exposure to environmental tobacco smoke also occurs disproportionately in disadvantaged populations because of the higher prevalence of smoking in low-status groups. Physical exposures such as these affect asthma etiology prenatally and throughout childhood.

Research has convincingly linked stress to both the etiology and management of asthma.^{7,8} Stress contributes to asthma etiology directly by impairing immune function and indirectly through its effect on smoking. This occurs both prenatally (via maternal stress and smoking) and during childhood. Stress complicates effective asthma management by reducing the psychological resources families coping with asthma have to seek care and comply with preventive measures. However, few studies have documented those aspects of the social environment that create levels of stress that are harmful to health and that could underlie socioeconomic and racial disparities in asthma. As conceptualized here, stress is inherently a property of an individual, the result of exposure to experiences and events with which the individual cannot readily cope.⁹ The social environment may contribute to stress by affecting the individual's exposure to experiences and events *or* by affecting the individual's ability to cope. Furthermore, the cumulative balance, over the course of development, between chronic and acute stress and stress-buffering supports is consequential for health.¹⁰

Health behaviors and psychological factors are closely associated with stress pathways. Mental disorders may be influenced by genetic risk and triggered by stressful events produced by the mechanisms elaborated above. Perceptions of control over the environment, and related factors such as self-efficacy, etc., are in part a function of the experience of unpredictable and stressful environments (e.g., violence¹¹). Thus, as noted above, individual factors and stressful environments reinforce each other in the etiology of asthma. Health behaviors may be in part a response to stress (e.g., substance use). Such behaviors are also, however, influenced by health information and community norms.

Access to health care is relevant to both asthma etiology and management. Although asthma is more prevalent in geographic areas with a high density of health care providers,¹² access depends as much on social, cultural, and economic constraints as on geographic ones. Access issues may affect the etiology of asthma via the timeliness of prenatal care and health care during infancy and childhood. Asthma management practices are strongly related to asthma mortality and hospitalization; poor management of asthma (delays in seeking care, under-use of anti-inflammatory medications) is in turn associated with a variety of social, cultural, and economic barriers to care.⁵

Research that identifies the nature of the social processes that contribute to these pathways is not yet well developed, but they are likely to be multiple and complex. For example, neighborhood crime and violence may contribute to asthma a) by increasing the experience of stress by community residents; b) by undermining the maintenance of social ties that can help to buffer stress; c) by making it less likely that pharmacies will locate in the area; d) by making it more difficult for community residents to go out to their doctor's appointments. Figure 1 provides a summary of relevant factors at the social environmental, family, and individual levels. Below, we develop two hypotheses that articulate the influence of specific elements of the social environment on asthma etiology and management.

Sub-hypothesis 1. The relationship between socioeconomic status, race/ethnicity, and asthma incidence and morbidity is explained, in part, by socially determined differential exposure to physical environmental risk factors (i.e., diesel-related air pollutants, allergens) and psychosocial stress. These effects are moderated by policies and programs that buffer the effects of economic disadvantage on families.

As discussed above, the concentration of poor and minority children in unhealthy environments is a function of the limited housing choices available to such families and the effects of economic, political, and social disadvantage on their ability to leave or change their environments. However, public policies and programs may differentially buffer these effects. The concentration of minority populations in unhealthy environments is exacerbated by discriminatory housing practices⁶ theoretically governed by public policies. Studies have clearly documented linkages between the low income, substandard housing and exposure to asthma-triggering factors such as smoke, dust mites, cockroaches, rodents, dry heat, and lack of heat.¹³ In the Moving to Opportunity study, a housing-mobility experiment in which a random sample of families in public housing were offered the opportunity to move to low-poverty neighborhoods, the incidence of asthma attacks was reduced among the movers group compared

to those not given the opportunity to move.¹⁴ It is plausible that public policies influencing housing conditions as well as housing location may also influence exposure to asthma-causing antigens.

Economic disadvantage is associated with greater levels of psychosocial stress.¹⁵ Children growing up in poverty show early signs of elevated allostatic load, including elevated secretion of cortisol and epinephrine, and higher resting blood pressure. Children who live in sustained poverty and those who become poor are more likely to be exposed to family violence and inadequate parenting.¹⁶ In turn, parenting problems and family stress have been linked to both wheeze and asthma in children.^{8,17} Social service programs that alleviate poverty may influence stress levels experienced by families and children, as well as the resources available to families for coping with stress. Relevant programs include income transfer programs and programs that deliver in-kind resources and services (e.g., school lunch, housing, and home-visiting programs). Specific impacts of such programs on asthma etiology have not been assessed.

Sub-hypothesis 2: Economic, cultural, and social features of the local area influence: (1) exposure to stressful life conditions and events; (2) the availability of social ties that provide informational, emotional and instrumental resources to individuals and families; and (3) shared norms influencing health behaviors. These, in turn, influence outcomes including immunological functioning in the child, the likelihood that the child will develop asthma, and asthma severity and management.

Many environmental conditions have been hypothesized to contribute to the experience of stress by the residents of urban communities. These include poverty, community disorganization, crime and violence, social incivility, noise, crowding, hazardous conditions, physical decay, and unemployment^{11,18}. Aspects of the social environment hypothesized to influence individuals' ability to cope with stressful events include community economic resources, social cohesion, and social support networks. The presence and integration of community institutions that provide resources and services and reinforce social ties also contribute to resiliency in the face of stress. Suggestive evidence of the value of social support comes from a study of asthma management in inner-city children. In this study, two groups received home visits, but in only one were asthma prevention measures actually implemented. In both groups acute visits for asthma were reduced relative to the control group that received no home visits, but no difference existed between the two home visit groups¹⁹.

Cultural norms in groups and communities can influence asthma etiology by affecting the presence of stressors such as social incivility and buffers such as social cohesion and the prevalence of instrumental exchange. They may also directly affect exposure to contaminants (norms regarding housekeeping practices, smoking), and the response to and treatment of asthma symptoms. For example, several studies have pointed to delays in seeking care for asthma symptoms as a factor in asthma mortality. The delays, in turn, are related to cultural beliefs that symptoms are a natural part of life that must be "toughed out"⁵.

These economic, cultural, and social conditions are interrelated and feed back on one another. For example, violent crime is reduced in neighborhoods with high levels of collective efficacy.²⁰ In communities with high levels of crime and few community institutions, there are fewer safe

common spaces for social interaction among neighbors. In neighborhoods without jobs, social interaction may be limited by the need to travel long distances to places of employment, and by the family and residential instability that accompanies low income. Together, social networks, social institutions, and the cultural makeup of neighborhoods and communities have a strong impact on what health messages are heard, and which are supported by informal communication networks.

These interrelationships and pathways are better understood in the context of urban environments. Very little research has to date examined pathways between the social and environment and health in suburban or rural areas.

VII. Potential for innovative research

Research that links the characteristics and dynamics of the social environment to biological pathways resulting in the development and severity of asthma is in its infancy. A study of the scope of the NSC is necessary to adequately model the contributions of various social environmental domains and factors to the behavioral, psychological, and biological processes that lead to asthma and complicate its management. Opportunities for innovation include:

- The opportunity to further develop research regarding the environmental determinants of stress-induced changes in physiological functioning. Current theory points to a variety of environmental factors, but does not adequately integrate existing social science theory on the social, economic, political, and cultural processes that shape the environments that individuals occupy. Integration of epidemiological and social science perspectives will greatly enrich the potential of stress research and could point the way to innovative interventions.
- The opportunity to extend social science research on the dynamics of disadvantaged urban neighborhoods to incorporate specific health processes and outcomes, using biomarker data from mothers and infants as well as direct measurement of social environmental processes.
- The opportunity to study the relevance of existing models of social environmental influences on asthma in non-urban areas.

VIII. Feasibility

A. Sampling needs

1. The study sample must include areal units (e.g., an urban neighborhood or rural community) that are broadly representative of the United States and diverse with respect to race/ethnic composition, socioeconomic status, rural/suburban/urban location, region, proximity to health services, public policy environment, and physical environmental exposures.
2. In selected communities, in-depth studies are recommended to provide richer data on the social dynamics of communities, cultural norms affecting asthma management, and the impact of the policy environment.

3. Families (the focal child plus primary caretaker) must be tracked to new destinations and the circumstances prompting moves documented.
4. Sample size – adequate samples within areal units are required for multi-level modeling of community effects.

B. Contact/Assessment

Assessments of most or all of the measures below are desirable during pregnancy, early infancy, and every two to three years during childhood.

C. Nature of measurement

Measurement of asthma symptoms, severity, etc. and the biological pathways underlying etiology is left to the asthma working group. It will also be important to measure mother's attitudes towards symptoms, also health care contacts and medication, compliance, etc.

Other needed measures include the following. Except where noted, data to be collected through interview.

Community/neighborhood level (all available through administrative records except collective efficacy, social cohesion):

- Characteristics of the public policy environment
- Neighborhood poverty, racial/ethnic composition, segregation, job market characteristics
- Violence, crime, social cohesion, collective efficacy in neighborhood
- Physical exposures (housing characteristics, pollutants)
- Proximity to health services, pharmacies

Family/household level:

- Income, parental education, family structure, employment, homeownership, language
- Family enrollment in welfare, social service programs, health insurance (possible collection via administrative records?)
- Residence history and reasons for moves
- Parenting, family conflict, and parental behaviors (e.g. smoking)
- Physical exposures within household (via physical samples?); housekeeping practices
- Maternal stress (use available scales)
- Mother's social networks and social support (available scales)

D. Burden on participant and family

Much of the information needed above is also required for studies of other outcomes.

E. Ethical consideration **if any**

None unique to asthma etiology and management; general issues include need to protect privacy of individuals and communities, when to intervene in families to protect children's health.

IX. References

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